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REMARKS/ARGUMENTS

Responsive to the Official Action mailed April 21, 2004, Applicants provide the following remarks. Reconsideration and allowance of the subject application, as amended, are respectfully requested.

35 USC §102 Claim Rejections

Applicants have cancelled, without prejudice, claim 1 – 9. Accordingly, the Examiner's rejection of such claims under 35 USC 102(b) as being anticipated by Bogdan (U.S. Pat. No. 6,137,240) is now moot.

The Examiner also rejected claims 10 – 16 under 35 USC 102(e) as being anticipated by Cooke et al (U.S. Pat. No. 6,366,070). Applicants' amended claim 10 requires a circuit having at least one switch, and a controller. Claim 10 requires the controller have "a skip mode wherein said controller maintains said at least one switch in an OFF state, said controller responsive to a timer, said timer configured to count for a predetermined time interval upon a start of a first period of said periodic control signal, said controller responsive to expiration of said predetermined time interval to disable said skip mode so that said at least one switch changes states at a frequency rate greater than an audible frequency limit for humans."

Applicants have also cancelled claim 14, without prejudice, since the limitation of claim 14 has been incorporated into claim 10.

Cooke discloses a switching regulator capable of operating in three different operating modes. These three operating modes include 1) an operating mode for heavy loads, 2) for moderate-to-light loads, and 3) for very light loads. Cooke teaches "[f]or heavy loads, the

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switching components are operated at a constant frequency. For moderate-to-light loads, the dual modulation control scheme is used. For very light loads, the regulator enters a "pulse-skipping" mode which can achieve very low operating frequencies to further improve efficiency." Column 1, lines 50 – 55.

Cooke teaches switching between these three various modes can be made by comparing a CONTROL signal to various voltage threshold levels (see FIG. 3A of Cooke and column 5, lines 15 – 35). The CONTROL signal is based on the voltage level of the load compared to a reference voltage level V_{ref} as provided by amplifier 16. See Column 2, line 66 to Column 3, line 5. "[A]n extremely light load or no load cause CONTROL to be less than the V_1 voltage applied to PWM comparator 30" Column 5, lines 37 – 39 with reference also to FIG. 2.

Importantly, for the third operating mode for very light loads, Cooke teaches that "transistor M1 will be held off as long as CONTROL remains below V_1 ... – thereby reducing the regulator's switching frequency. A duty ratio of zero can be achieved via this mechanism if, for example, the load current suddenly decreases to zero." Column 5, lines 42 – 45.

In other words, Cooke teaches to keep the switching regulator in its third operating mode for very light loads to keep transistor M1 off as long as the output voltage level is indicative of very light load conditions. In contrast to that taught by Cooke, claim 10 requires that a controller that is "responsive to expiration of said predetermined time interval to disable said skip mode so that said at least one switch changes states at a frequency rate greater than an audible frequency limit for humans."

In summary, Cooke does not disclose, teach, or suggest a controller that is "responsive to expiration of said predetermined time interval to disable said skip mode so that said at least one

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switch changes states at a frequency rate greater than an audible frequency limit for humans."

Rather, Cooke teaches to maintain its third operating mode for very light loads as long as a voltage level representative of the output voltage is indicative of very light load conditions.

Turning to claims 17 – 20, the Examiner rejected such claims under 35 USC 102 as being anticipated by Bogdan. Applicants' amended claim 17 requires "monitoring if said switch is in a skip mode; and disabling said skip mode in response to an expiration of said predetermined time interval so that said switch changes states at a frequency rate greater than said audible frequency for humans."

Bogdan is directed to a "universal ballast control circuit." See abstract of Bogdan. Bogdan teaches an inverter 116 (see FIGs. 2 and 3) having a half bridge MOSFET driver 117 driving MOSFETS Q_A and Q_B. Column 6, lines 7 – 17. Bogdan does not disclose, teach, or suggest where such transistors Q_A and Q_B have a "skip mode" and, in particular, "disabling said skip mode in response to an expiration of said predetermined time interval" as required by claim 17. In addition, claim 17 requires the "switch changes states at a frequency rate greater than said audible frequency for humans." Bogdan does not disclose, teach, or suggest such a frequency rate.

Claim 18 is a dependent claim that depends directly from claim 17 and as such incorporates all the limitations of claim 17. Accordingly, Applicants respectfully submit that claim 18 is in condition for allowance by virtue of its dependency from claim 17, as well as for its own limitations. Applicants have cancelled, without prejudice, claims 19 and 20.

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Applicants have also cancelled, without prejudice, claims 28 - 30. Accordingly, the Examiner's rejection of such claims under 35 USC 102(e) as being anticipated by Deller (U.S. Pat. No. 6,313,616) is now moot.

35 USC §103 Claim Rejection

The Examiner also rejected claims 21 - 27 under 35 USC 103(a) as being unpatentable over Cook in combination with Brown (U.S. Pat. No. 5,959,441).

Claim 21 requires, among other things, "a controller configured to provide a PWM signal in a first state during a first time interval based on a first signal representative of said input voltage less a second signal representative of said output voltage." Applicants find nothing in Cooke that discloses, teaches, or suggests such a controller. Rather, Cooke teaches a switch controller 20 that varies the duty cycle of the switch in response to a level of the output voltage as represented by the CONTROL signal output from amplifier 16 (see FIG. 1, 2, 5, and 6 of Cooke).

Claim 21 further requires "a logic circuit configured to provide a low side enabling signal having an enabling and disabling state, wherein said PWM signal controls said low side switch when said low side enabling signal is in said enabling state, said logic circuit receiving a comparison signal from an over current comparator, said over current comparator configured to provide said comparison signal based on said current level through said inductor compared to a threshold current value, wherein said logic circuit is further configured to provide said low side enabling signal in said enabling state if said current level in said inductor is greater than said threshold current value." Applicants find nothing in Cooke that discloses, teaches, or suggests

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such a logic circuit, and the Examiner has not pointed to specific portions of Cooke to teach such limitations.

Claim 22 is a dependent claim that depends directly from claim 21 and as such incorporates all the limitations of claim 21. Accordingly, Applicants respectfully submit that claim 22 is in condition for allowance by virtue of its dependency from claim 21, as well as for its own limitations.

Claim 23 is a method claim for a "method of sensing an input voltage level of a DC to DC converter utilizing an existing pin coupled to a switching node of the DC to DC converter, said method comprising: determining a state of a high side switch coupled to an input voltage source and said switching node; determining a state of a low side switch coupled between ground and said switching node; and sensing said input voltage when said high side switch is closed and said low side switch is open." Applicants find nothing in Cooke that discloses, teaches, or suggests such a method as required by claim 23, and the Examiner has not pointed to specific portions of Cooke to teach such limitations.

Claim 24 is a dependent claim that depends directly from claim 23 and as such incorporates all the limitations of claim 23. Accordingly, Applicants respectfully submit that claim 24 is in condition for allowance by virtue of its dependency from claim 23, as well as for its own limitations.

Claim 25 is directed to DC to DC converter requiring, among other things, "an input pin terminal coupled to a switching node of a DC to DC converter, said switching node of said DC to DC converter coupled to an input voltage when a high side switch is closed and a low side switch is open." Claim 25 also requires "an input voltage sensing circuit coupled to said input pin."

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Applicants find nothing in Cooke that discloses, teaches, or suggests such a DC to DC converter as required by claim 25, and the Examiner has not pointed to specific portions of Cooke to teach such limitations.

Claim 26 is a dependent claim that depends directly from claim 25 and as such incorporates all the limitations of claim 25. Accordingly, Applicants respectfully submit that claim 26 is in condition for allowance by virtue of its dependency from claim 25, as well as for its own limitations.

Claim 27 requires, among other things, "a first phase controller configured to provide a first PWM signal based on a first signal representative of an input voltage to a DC to DC converter less a second signal representative of an output voltage of said DC to DC converter." As earlier adduced regarding claim 21, Applicants find nothing in Cooke that discloses, teaches, or suggests such a controller. Rather, Cooke teaches a switch controller 20 that varies the duty cycle of the switch in response to a level of the output voltage as represented by the CONTROL signal output from amplifier 16 (see FIG. 1, 2, 5, and 6 of Cooke). In addition, Brown (U.S. Patent No. 5,959,441) does not supply this missing teaching.

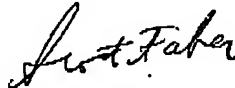
Applicants have added new method claims 31 – 33. No new matter has been entered. Support for such claims can be found throughout the specification including FIG. 10 and page 24, line 16 to page 26, line 3. For reasons similar to those earlier detailed, Applicants submit that such new claims are also allowable.

Accordingly, Applicants respectfully submit that in light of the foregoing claim amendments and remarks, all of the presently pending claims are now in a condition for allowance. Reexamination and reconsideration are respectfully requested. Early allowance is

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earnestly solicited. In the event the Examiner deems personal contact desirable in disposition of this application, the Examiner is respectfully requested to call the undersigned attorney at (603) 668-6560. In the event any additional fees are payable, please charge them to our Deposit Account No. 50-2121.

Respectfully submitted,



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